

PATENT ABSTRACTS OF JAPAN

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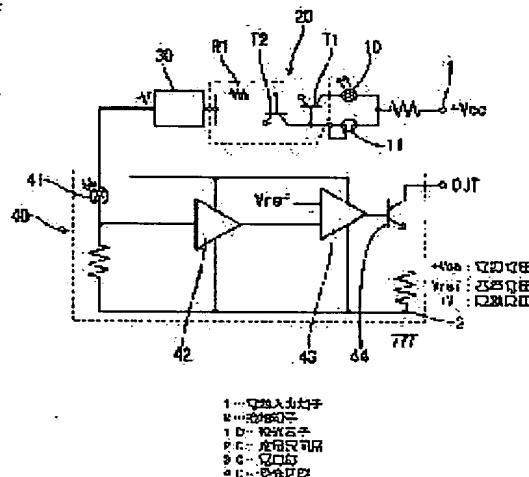
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(54) PHOTOELECTRIC SENSOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a photoelectric sensor which enables stable detection independently of a supplied power source voltage while restraining a consumption current of the whole circuit.

SOLUTION: A projecting and receiving light circuit is constituted by connecting a light projecting element 10, a power source part 30 and a light receiving circuit 40 in series between a power source input terminal 1 and a ground terminal 2. A constant current circuit 20 is connected in series with the light projecting element 10 between the power source input terminal 1 and the power source part 30. Since the light projecting element 10 is connected in series with the light receiving circuit 40, a consumption current of the whole circuit can be restrained. The light projecting element 10 is driven by a prescribed constant current by the constant current circuit 20 independently of a power source voltage, so that the amount of a projection light is stabilized. Thereby stable detection is enabled while restraining the consumption current of the whole circuit.



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JAPANESE

[JP,2002-171163,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] A photoelectrical sensor characterized by having arranged a current regulator circuit which supplies constant current to said floodlighting element between said power supply input terminals and said constant-voltage sections to said floodlighting element and serial in a photoelectrical sensor which comes to carry out series connection of the constant-voltage section which supplies power of a constant voltage between a power supply input terminal and an earth terminal in a floodlighting element, a light-receiving circuit, and said light-receiving circuit.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the photoelectrical sensor which comes to carry out series connection of a floodlighting element, a light-receiving circuit, and the constant-voltage section that supplies the power of a constant voltage to a light-receiving circuit between a power supply input terminal and an earth terminal.

[0002]

[Description of the Prior Art] The light-receiving circuit is connected with the floodlighting element to DC power supply at the serial like JP,4-2131,U in the photoelectrical sensor of the conventional two-wire system (refer to drawing 3). By this, since it becomes unnecessary to supply current to each of a floodlighting element and a light-receiving circuit, the consumed electric current of the whole circuit can be reduced.

[0003]

[Problem(s) to be Solved by the Invention] Generally by the photoelectrical sensor, fixed width of face called 12-24V is given to the tolerance of supply voltage. However, with the above-mentioned conventional configuration, since the inrush currents to a circuit differ if supply voltage differs as a result, the floodlighting current supplied to a floodlighting element will also differ according to supply voltage. For this reason, the amount of floodlighting will change with supply voltage, and there was a defect that stable detection could not be performed.

[0004] This invention was made in view of the above-mentioned situation, and the purpose is in the place which offers the photoelectrical sensor which can perform detection stabilized irrespective of the supply voltage supplied, stopping the consumed electric current of the whole circuit.

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the photoelectrical sensor concerning invention of claim 1 has the feature at the place which has arranged a current regulator circuit which supplies constant current to said floodlighting element between said power supply input terminals and said constant-voltage sections to said floodlighting element and serial in the photoelectrical sensor which comes to carry out series connection of the constant-voltage section which supplies power of a constant voltage between a power supply input terminal and an earth terminal in a floodlighting element, a light-receiving circuit, and said light-receiving circuit.

[0006]

[Function and Effect of the Invention] According to the configuration of <invention of claim 1> claim 1, since a light-receiving circuit is connected with a floodlighting element at a serial, the consumed electric current of the whole circuit can be stopped compared with what carried out parallel connection. Here, since a floodlighting element is driven in a current regulator circuit and it is driven according to predetermined floodlighting current irrespective of supply voltage, the amount of floodlighting is stabilized by it. The stable detection is attained this stopping the consumed electric current of the whole circuit.

[0007]

[Embodiment of the Invention] Drawing 1 and drawing 2 explain the operation gestalt of this invention. As shown in drawing 1, series connection of the floodlighting element 10 which consists of LED, a power supply section 30, and the light-receiving circuit 40 is carried out between the power supply input terminal 1 and an earth terminal 2, and a photoelectrical sensor is constituted between, and is equipped with the light emitting/receiving circuit which has arranged the current regulator circuit 20 to the floodlighting element 10 and the serial among the power supply input terminal 1 and power supply section 30.

[0008] Parallel connection of FET11 is carried out to the floodlighting element 10. Irrespective of load voltage (drain-source voltage), this thing operates so that almost fixed drain current may be passed to a current regulator circuit 20. The current regulator circuit 20 is constituted by two transistors T1 and T2 and resistance R1. If the drain current of FET11 flows at the base, a transistor T1 incorporates collector current from the output terminal of the floodlighting element 10, and it is connected so that an emitter current may be passed to resistance R1. On the other hand, if the emitter current of a transistor T1 flows at the base, a transistor T2 incorporates a part of drain current from FET11 as collector current, and it is connected so that an emitter current may be passed to a power supply section 30.

[0009] A power supply section 30 is the so-called voltage stabilizer, and, regardless of the voltage of a power

supply, supplies the power of a predetermined voltage value to the light-receiving circuit 40 (photo detector) etc. 5V are supplied as driver voltage for specifically driving electronic parts, such as a transistor. The light-receiving circuit 40 consists of the photo detector 41 which consists of a photodiode, an op amplifier 42, a comparator 43, and an output transistor 44. Among those, the photo detector 41 is arranged between the output terminal of a power supply section 30, and the earth terminal 2. To the op amplifier 42, the output terminal of said photo detector 41 is connected to the input terminal, and the input terminal of a comparator 43 is connected to the output terminal. The output terminal of a comparator 43 is connected with the output transistor 44.

[0010] An operation of the photoelectrical sensor by the above-mentioned configuration is explained. If supply voltage V_{cc} is supplied to a light emitting/receiving circuit, the floodlighting element 10 will emit light. And the light received by the photo detector 41 among the light is amplified by the op amplifier 42 as a light-receiving signal according to the quantity of light, and is compared with reference voltage V_{ref} by the comparator 43. Here, reference voltage V_{ref} is set as light-receiving signal level in case for example, a detection body does not exist. Therefore, when there is no detection body, the output transistor 44 is not driven. However, when a detection body exists, the quantity of light received by the photo detector 41 will decrease, light-receiving signal level will fall from reference voltage V_{ref} , and a comparator 43, as a result the output transistor 44 will drive. In addition, reference voltage V_{ref} can be made by another power circuit which is not illustrated based on the output of said power supply section 30.

[0011] Here, in a current regulator circuit 20, since the potential of the both ends of resistance R1 turns into the potential V_{be} between the base emitters of a transistor T2, the current I_r (V_{be}/R_1) of immobilization flows irrespective of supply voltage. Since the base current of a transistor T2 is very small, it can be considered that the emitter current and said current I_r of a transistor T1 are an EQC. Since base current is very small also in a transistor T1, collector current and an emitter current become almost equivalent. Therefore, the floodlighting current which flows for the floodlighting element 10 turns into the collector current = emitter current = current I_r (V_{be}/R_1) of a transistor T1, and serves as the fixed amount of current irrespective of supply voltage V_{cc} . In addition, as shown in drawing 2, even if it connects a floodlighting element to a serial to FET11, the same effect as the above is done so.

[0012] Thus, since the light-receiving circuit 40 is connected with the floodlighting element 10 at a serial, the consumed electric current of the whole circuit can be stopped. And since the floodlighting element 10 is driven with predetermined fixed current by the current regulator circuit 20 irrespective of supply voltage, the amount of floodlighting is stabilized by it. It becomes possible to perform stable detection, this stopping the consumed electric current of the whole circuit.

[0013] It is not limited to said operation gestalt and an operation gestalt which is explained below is also included in the technical range of this invention, and further, within limits which do not deviate from a summary besides the following, operation gestalt > this invention besides < can be changed variously, and can be carried out.

(1) With the above-mentioned operation gestalt, although the current regulator circuit 20 was constituted from transistors T1 and T2 and resistance R1, it may not be restricted to this, for example, may be a current regulator circuit by IC (operational amplifier), and a current regulator circuit by zener diode.

[0014] (2) Although [the above-mentioned operation gestalt] the floodlighting element 10 emits light on the fixed current by the current regulator circuit 20, even if it is the case where pulse lighting is carried out by the switching circuit, do so the effect made into the purpose of this invention, for example.

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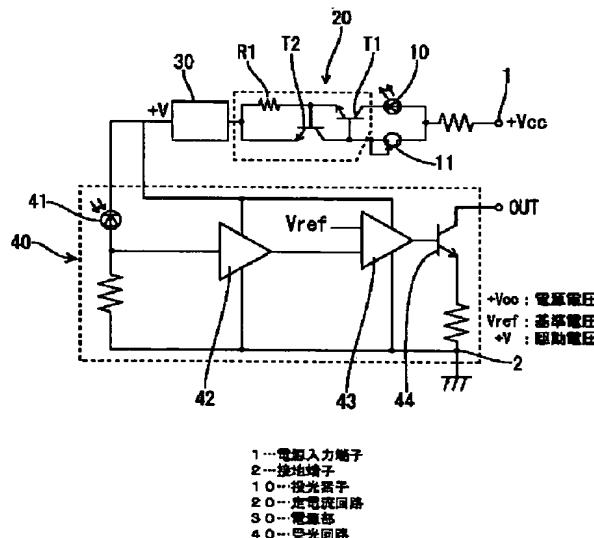
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(54)【発明の名称】 光電センサ

(57)【要約】

【課題】 回路全体の消費電流を抑えつつ、供給される電源電圧にかかわらず安定した検出を行うことが可能な光電センサを提供する。

【解決手段】 投受光回路は、電源入力端子1と接地端子2との間に、投光素子10と、電源部30と、受光回路40とを直列接続して構成され、その電源入力端子1と電源部30の間に、定電流回路20を投光素子10と直列に配置してある。投光素子10と受光回路40が直列に接続されるから、回路全体の消費電流を抑えることができる。しかも投光素子10は電源電圧にかかわらず定電流回路20により所定の一定電流で駆動されるので投光量が安定する。これにより回路全体の消費電流を抑えつつ、安定した検出を行うことになる。



【特許請求の範囲】

【請求項1】 電源入力端子と接地端子との間に、投光素子と、受光回路と、前記受光回路へ定電圧の電力を供給する定電圧部とを直列接続してなる光電センサにおいて、前記電源入力端子と前記定電圧部の間に、前記投光素子へ定電流を供給する定電流回路を前記投光素子と直列に配置したことを特徴とする光電センサ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、電源入力端子と接地端子との間に、投光素子と、受光回路と、受光回路へ定電圧の電力を供給する定電圧部とを直列接続してなる光電センサに関する。

【0002】

【従来の技術】従来の2線式の光電センサは、実開平4-2131号などのように直流電源に対して投光素子と受光回路が直列に接続されている(図3参照)。これによつて、投光素子と受光回路のそれぞれに電流を供給する必要がなくなるので、回路全体の消費電流を低減することができる。

【0003】

【発明が解決しようとする課題】一般に光電センサでは、電源電圧の許容範囲に例えれば12~24Vという一定の幅を持たせてある。しかし、上述の従来構成では、電源電圧が異なると回路への流入電流が異なってしまうので、ひいては投光素子へ供給される投光電流も電源電圧に応じて異なることになる。このため電源電圧によって投光量が異なることになり、安定した検出を行えないという欠点があった。

【0004】本発明は、上記事情に鑑みてなされたもので、その目的は、回路全体の消費電流を抑えつつ、供給される電源電圧にかかわらず安定した検出を行うことが可能な光電センサを提供するところにある。

【0005】

【課題を解決するための手段】上記目的を達成するため、請求項1の発明に係る光電センサは、電源入力端子と接地端子との間に、投光素子と、受光回路と、前記受光回路へ定電圧の電力を供給する定電圧部とを直列接続してなる光電センサにおいて、前記電源入力端子と前記定電圧部の間に、前記投光素子へ定電流を供給する定電流回路を前記投光素子と直列に配置したところに特徴を有する。

【0006】

【発明の作用及び効果】<請求項1の発明>請求項1の構成によれば、投光素子と受光回路が直列に接続されるので、並列接続したものに比べて回路全体の消費電流を抑えることができる。ここで、投光素子は定電流回路で駆動されるので電源電圧にかかわらず所定の投光電流によって駆動されるから、投光量が安定する。これにより

回路全体の消費電流を抑えつつ、安定した検出が可能になる。

【0007】

【発明の実施の形態】本発明の実施形態を図1及び図2によって説明する。光電センサは、図1に示すように、電源入力端子1と接地端子2との間に、例えばLEDからなる投光素子10と、電源部30と、受光回路40とを直列接続して構成され、その電源入力端子1と電源部30の間に、定電流回路20を投光素子10と直列に配置した投受光回路を備えたものである。

【0008】投光素子10には、FET11が並列接続されている。このものは負荷電圧(ドレンソース電圧)にかかわらずほぼ一定のドレイン電流を定電流回路20に流すように動作する。定電流回路20は、2つのトランジスタT1、T2と抵抗R1によって構成されている。トランジスタT1は、FET11のドレイン電流がベースに流れると、投光素子10の出力端子からコレクタ電流を取り込み、抵抗R1へエミッタ電流を流すよう接続されている。一方、トランジスタT2は、そのベースにトランジスタT1のエミッタ電流が流れると、FET11からのドレイン電流の一部をコレクタ電流として取り込み、電源部30へとエミッタ電流を流すよう接続されている。

【0009】電源部30は、いわゆる定電圧回路であつて、電源の電圧に関係なく、所定の電圧値の電力を受光回路40(受光素子)などに供給する。具体的にはトランジスタなどの電子部品を駆動するための駆動電圧として、例えは5Vを供給する。受光回路40は、例えはフォトダイオードからなる受光素子41と、OPアンプ42と、コンパレータ43と、出力トランジスタ44とかなる。そのうち受光素子41は電源部30の出力端子と接地端子2との間に配置されている。OPアンプ42に対しては、その入力端子には前記受光素子41の出力端子が接続され、その出力端子にはコンパレータ43の入力端子が接続されている。コンパレータ43の出力端子は、出力トランジスタ44と接続されている。

【0010】上記構成による光電センサの作用について説明する。投受光回路に電源電圧Vccが供給されると投光素子10が発光する。そしてその光のうち、受光素子41にて受光された光は、その光量に応じた受光信号としてOPアンプ42で増幅され、コンパレータ43にて基準電圧Vrefと比較される。ここでは、基準電圧Vrefは、例えは検出物体が存在しないときの受光信号レベルに設定されている。従つて、検出物体がないときには出力トランジスタ44は駆動しない。ところが、検出物体が存在するときには、受光素子41にて受光される光量が減少して、受光信号レベルが基準電圧Vrefよりも低下してコンパレータ43ひいては出力トランジスタ44が駆動することになる。なお、基準電圧Vrefは、例えは前記電源部30の出力にもとづいて図示

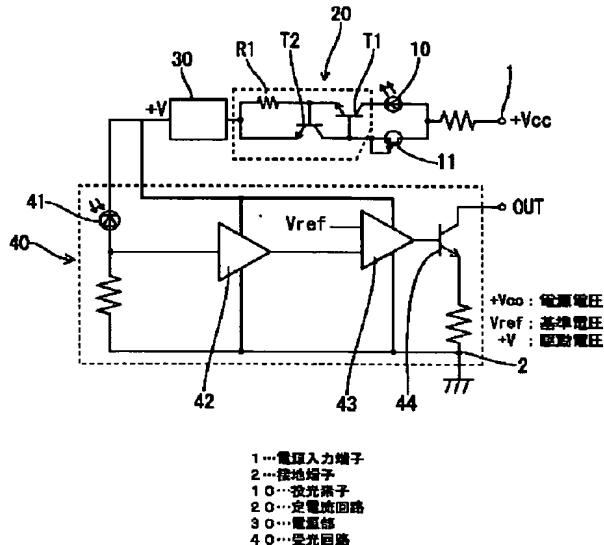
しない別の電源回路によって作ることができる。

【0011】ここで、定電流回路20において、抵抗R1の両端の電位はトランジスタT2のベースエミッタ間の電位Vbeになるので、電源電圧にかかわらず固定の電流Ir ($Vbe/R1$) が流れる。トランジスタT2のベース電流はきわめて小さいので、トランジスタT1のエミッタ電流と前記電流Irは同等と見なせる。トランジスタT1においてもベース電流はきわめて小さいので、コレクタ電流とエミッタ電流はほぼ同等となる。したがって投光素子10に流れる投光電流はトランジスタT1のコレクタ電流=エミッタ電流=電流Ir ($Vbe/R1$) となり、電源電圧Vccにかかわらず一定の電流量となる。なお、図2に示すように、投光素子をFET11に対し直列に接続したものであっても上記と同様の効果を奏する。

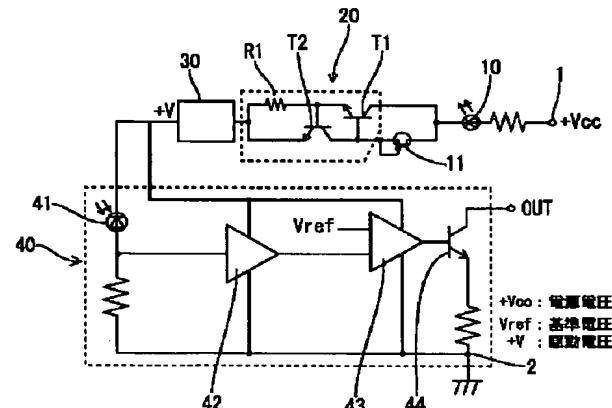
【0012】このように、投光素子10と受光回路40が直列に接続されるから、回路全体の消費電流を抑えることができる。しかも投光素子10は電源電圧にかかわらず定電流回路20により所定の一定電流で駆動されるので投光量が安定する。これにより回路全体の消費電流を抑えつつ、安定した検出を行うことが可能になる。

【0013】<他の実施形態>本発明は、前記実施形態に限定されるものではなく、例えば、以下に説明するような実施形態も本発明の技術的範囲に含まれ、さらに、

【図1】



[図2]



【図3】

